$$360 - \left[\cos^{-1}\left[\frac{d_2^2 + d_4^2 - L_{2-4}^2}{2d_2d_4} \right] + \cos^{-1}\left[\frac{d_4^2 + d_7^2 - L_{4-7}^2}{2d_4d_7} \right] + \right. \tag{7}$$

$$\left. \cos^{-1}\left[\frac{d_2^2 + d_7^2 - L_{2-7}^2}{2d_2d_7} \right] \right] = 0$$

The calculation of the distances d_2, d_4 and d_7 will be most accurate when each of the terns of equation 7 are positive and when the left side of the equation equals 0. The only variables in the calculations of d_2, d_4 and d_7 are the propagation path slopes B_2, B_4 and B_7, respectively, which values are generally bound as: 20 dB/dec$\leq$B$\leq$45 dB/dec. Thus, the values d_2, d_4 and d_7 are calculated using equations 4, 5, and 6 while varying the propagation path slopes B_2, B_4, and B_7 between 20 dB/dec and 45 dB/dec. The resulting distances d_2, d_4 and d_7 are then used to evaluate equation 7. The values of d_2, d_4 and d_7 for which the result of equation 7 is closest to 0 with all its terms positive gives values for d_2, d_4 and d_7 with reduced error components.

When the distances d_2, d_4 and d_7 which have the reduced error components are found, the location area of the mobile telephone 120 is determined by plotting appropriate circles as described above. The geographic location (i.e. latitude and longitude) of antennas 102, 104, 107 in the geographic serving area 100 are known and, in one embodiment, are stored as cell site-information 236 in the memory 234 of the MLM 230. The MLM 230 uses these known cell site locations to determine the geographic location of the estimated location area using techniques which are well known in the art. For example, the actual geographic location of the mobile telephone can then be determined by plotting the estimated location area on a geographic map.

Once the geographic location area is determined, the MLM 230 routes the information to the appropriate end user destination. The appropriate routing information 240, in one embodiment, is stored in memory 234 of the MLM 230. For example, if the location function was initiated because of a 911 call from the mobile telephone 120, the MLM 230 will route the location information to the appropriate public service provider. If the location function was initiated because the MSC determined that the cellular telephone number belonged to a fleet company, the location information would be sent to the appropriate fleet company. Further, the location information could be communicated to the mobile telephone 120 itself if the request for location information came from the user of the mobile telephone 120.

The foregoing Detailed Description is to be understood as being in every respect illustrative and exemplary, but not restrictive, and the scope of the invention disclosed herein is not to be determined from the Detailed Description, but rather from the claims as interpreted according to the full breadth permitted by the patent laws. It is to be understood that the embodiments shown and described herein are only illustrative of the principles of the present invention and that various modifications may be implemented by those skilled in the art without departing from the scope and spirit of the invention. For example, the detailed description described a method for calculating a location estimate by using three signal strengths. However, the principles of the present invention could be extended to perform such a calculation using more than three signal strengths. Such an extension could be readily implemented by one of ordinary skill in the art given the above disclosure.

I claim:

1. A method for locating a mobile telephone within the geographic serving area of a mobile telephone system, wherein said mobile telephone is capable of sending signals to and receiving signals from antennas located in cells within the geographic serving area, the method comprising the steps of:

a) receiving signal strength data representing the signal strengths of signals being received by the mobile telephone from a first plurality of antennas, each of said signal strengths being dependent, at least in part, on a cell propagation characteristic;

b) calculating the distances between the mobile telephone and each of a second plurality of antennas using said signal strength data and an estimated cell propagation characteristic value, wherein each of said calculated distances contains an error component which depends upon the estimated cell propagation characteristic value;

c) repeating step b) while varying the estimated cell propagation characteristic values to reduce said error components; and

d) calculating the location of the mobile telephone using the calculated distances having reduced error components.

2. The method of claim 1 wherein said estimated cell propagation characteristic is propagation path slope.

3. The method of claim 1 wherein said estimated cell propagation characteristic is antenna pattern rolloff.

4. The method of claim 1 wherein said estimated cell propagation characteristic is the height of the mobile telephone relative to each of said second plurality of antennas.

5. The method of claim 1 wherein step d) further comprises the step of:

calculating the location of the mobile telephone as the intersection area of a plurality of circles, each of said circles having a center at the location of one of said second plurality of antennas and having a radius equal to the calculated distance between the mobile telephone and the antenna.

6. The method of claim 1 further comprising the step off

e) transmitting the calculated location of the mobile telephone.

7. The method of claim 1 wherein said signal strength data includes a MAHO list maintained by said mobile telephone.

8. The method of claim I wherein said first plurality of antennas and said second plurality of antennas are the same.

9. A method for locating a mobile telephone within the geographic serving area of a mobile telephone system, wherein said mobile telephone is capable of sending signals to and receiving signals from antennas located within the geographic serving area, the method comprising the steps of:

receiving at a mobile switching center a call initiation request including an identification of the mobile telephone;

determining in the mobile switching center in response to said call initiation request if a mobile telephone location function is required, wherein said determination is based, at least in part, on the identification of the mobile telephone;

initiating a mobile telephone location function from the mobile switching center if the mobile switching center determines that said location function is required;

said location function comprising the steps:

receiving signal strength data representing the signal strengths of signals being received by the mobile telephone from a first plurality of antennas;

calculating the distances between the mobile telephone and each of a second plurality of antennas using said signal strength data; and